

## Unit 6 Lesson 2B : Sum & Difference for Tangents

I. Warm-Up: Pop-quiz yourself.

$$\cos(\alpha + \beta) =$$

$$\cos(\alpha - \beta) =$$

$$\sin(\alpha + \beta) =$$

$$\sin(\alpha - \beta) =$$

II. Objective: Today you will expand your formula knowledge to derive and apply sum and difference formulas for tangent

Homework: Finish classwork practice as needed. Study for your quiz tomorrow on properties (reciprocal, quotient, pythagorean, all sum + difference).

### III. Derive the formulas... (Verify)

Work with a partner to fill in the rest of the verification.

A.

$$\tan(\alpha + B) = \frac{\tan \alpha + \tan B}{1 - \tan \alpha \tan B}$$

$$= \frac{\sin(\alpha + B)}{\cos(\alpha + B)}$$

$$B. \quad -\tan(\alpha - B) = \frac{-\tan \alpha - \tan B}{1 + \tan \alpha \tan B}$$

$$= -\tan(\alpha - (-B))$$

## IV. Classwork / Homework Practice

Find the exact value. Don't leave  $\sqrt{\quad}$  in denominators.

21.  $\tan\left(\frac{\pi}{6} + \frac{\pi}{4}\right)$

22.  $\tan\left(\frac{\pi}{3} + \frac{\pi}{4}\right)$

23.  $\tan\left(\frac{4\pi}{3} - \frac{\pi}{4}\right)$

24.  $\tan\left(\frac{5\pi}{3} - \frac{\pi}{4}\right)$

27.  $\frac{\tan 10^\circ + \tan 35^\circ}{1 - \tan 10^\circ \tan 35^\circ}$

28.  $\frac{\tan 50^\circ - \tan 20^\circ}{1 + \tan 50^\circ \tan 20^\circ}$

31.  $\frac{\tan \frac{\pi}{5} - \tan \frac{\pi}{30}}{1 + \tan \frac{\pi}{5} \tan \frac{\pi}{30}}$

32.  $\frac{\tan \frac{\pi}{5} + \tan \frac{4\pi}{5}}{1 - \tan \frac{\pi}{5} \tan \frac{4\pi}{5}}$

Verify each identity:

37.  $\tan(2\pi - x) = -\tan x$

38.  $\tan(\pi - x) = -\tan x$

43.  $\tan\left(\theta + \frac{\pi}{4}\right) = \frac{\cos \theta + \sin \theta}{\cos \theta - \sin \theta}$

44.  $\tan\left(\frac{\pi}{4} - \theta\right) = \frac{\cos \theta - \sin \theta}{\cos \theta + \sin \theta}$

Find the exact value of the following:

a.  $\cos(\alpha + \beta)$

b.  $\sin(\alpha + \beta)$

c.  $\tan(\alpha + \beta)$

\* You do not need to rationalize the denominator. \*

59.  $\tan \alpha = -\frac{3}{4}$ ,  $\alpha$  lies in quadrant II, and  $\cos \beta = \frac{1}{3}$ ,  $\beta$  lies in quadrant I.

63.  $\tan \alpha = \frac{3}{4}$ ,  $\pi < \alpha < \frac{3\pi}{2}$ , and  $\cos \beta = \frac{1}{4}$ ,  $\frac{3\pi}{2} < \beta < 2\pi$ .